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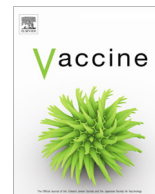


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Tailoring immunisation service delivery in a disadvantaged community in Australia; views of health providers and parents

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ABSTRACT

In 2014 the Australian immunisation target was raised from 90% to 95% of children to be fully immunised. A national priority is to identify geographic areas of low coverage and implement strategies to improve immunisation rates. Using The World Health Organization's Tailoring Immunization Programmes (TIP) Guidelines, the aim of this study was to identify areas of low immunisation coverage for children in the Hunter New England Local Health District, New South Wales, and to gain a deeper understanding of the factors influencing immunisation in those areas in order to develop tailored strategies for increasing immunisation coverage. Data from the Australian Immunisation Register was used to identify geographic areas of low coverage. Data from interviews and focus groups with parents and service providers were used to gain a deeper understanding of the factors influencing immunisation in those areas. The regional city of Maitland in New South Wales was identified as having a persistently high number and relatively high proportion of children not fully immunised ($n = 427$, 15.4% in 2016). Themes from 59 stakeholder interviews and focus groups included: (i) limited engagement with health services unless the need is urgent, (ii) multi-dimensional access barriers to immunisation services in Maitland, (iii) a flexible, supportive family centred, primary health care approach, utilising strong partnerships, is most likely to be effective in increasing childhood immunisation rates in Maitland, (iv) data can be used more effectively to inform service providers about trends and individual children not fully immunised. TIP guidelines proved useful for identifying areas of low coverage and providing an understanding of determining factors and the strategies most likely to be effective. Understanding the complex problems many parents face and the access barriers that contribute to low immunisation coverage is essential in developing appropriate solutions. Finding ways to support parents and remove those barriers can contribute to higher coverage. In Maitland, targeted outreach and home visiting has been implemented in consultation with community and health service representatives to ensure that the children from socially disadvantaged populations identified do not miss out on vaccination.

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1. Introduction

The World Health Organization's (WHO) recommended immunisation schedules have been widely implemented internationally, contributing to a significant decline in childhood morbidity and mortality [1]. However, there has been a re-emergence of measles,

pertussis and diphtheria in some European countries, associated with inadequate levels of immunisation [1]. WHO's Regional Office for Europe therefore developed the Guide to Tailoring Immunisation Programmes (TIP) [2], which draws on evidence from social psychology, the medical humanities, and behavioural science to assist service planners in identifying pockets of low coverage within a region and design strategies most likely to be effective in increasing immunisation within that target population. A recent evaluation of TIP found its strengths to be in community engagement, qualitative research methods, generating local insights and in the relationships established through the process [3].

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In Australia the National Immunisation Program Schedule [4] determines the recommended childhood vaccines (see Fig. 1). In 2014 the Australian Chief Medical Officer raised the aspirational target from 90% to 95% of children to be fully immunised [5]. A stated national priority is to identify geographic areas of low coverage and implement strategies to improve immunisation rates [6]. Immunisation is provided largely by general practitioners (GPs) under Medicare, the national funding model for medical services that underpins primary care. Bulk billing occurs when GPs bill Medicare directly and accept the rebate as full payment with no out of pocket cost to the patient [7]. GPs may charge additional fees at their discretion. A recent systematic review found that these supplementary payments reduced primary care utilisation by vulnerable groups, including individuals with low income and those in particular need of care [8]. The Australian Government introduced an amendment bill in 2016 entitled 'No Jab, No Pay' which tightened existing requirements that children be fully immunised in order to qualify for certain family assistance payments [9].

In the region covered by the Hunter New England and Central Coast Primary Health Network (PHN), immunisation coverage rates were above the national average for children aged one (93.1% vs 91.3%), two (91.3% vs 89.2%) and five years (94.8% vs 92.2%). Despite these achievements the new target of 95% remained elusive.

To tailor vaccination programs, TIP uses a step-by-step approach including a formative phase and a planning phase (see Fig. 2). We focused on the formative phase which involved using available data and stakeholder interviews to identify the problem and gain a clear understanding of the target groups (both children and service providers). Using TIP guidelines, the aim of this study

was to identify areas of low immunisation coverage in children aged five years and under in the Hunter New England Local Health District (HNELHD) and gain a deeper understanding of the factors influencing immunisation in those areas. The results will be used in the planning phase, to inform the development and implementation of evidence based strategies.

2. Materials and methods

Both quantitative and qualitative methods were used. To identify pockets of low immunisation coverage, data from the Australian Immunisation Register (AIR) were used. The register provides demographic data for children that are at least 30 days overdue for specified vaccines. State health authorities grant AIR access to public health services, GPs and other accredited immunisers, who are then able to generate relevant reports [10].

Initially, 2014 data from resident HNELHD children aged one, two and five years of age were used to determine the numbers not fully immunised according to SA2 locations (statistical areas of approximately 10,000 residents). Australian Bureau of Statistics 2011 Census population data were used to determine rates [11]. This process identified the SA2 areas [12] of Maitland East and Maitland West as having the highest number of under-vaccinated children (described in Results). Maitland is a growing regional city in NSW. In 2016 the population was 79,340 with Aboriginal and/or Torres Strait Islander people accounting for 5.1% of the total. Its economy relies on manufacturing, healthcare services and retail trade. In 2011, overall unemployment was 5.0%, below the national rate of 5.6% [13]. Maitland is relatively socio-economically disad-

Age	Vaccine
Birth	<ul style="list-style-type: none"> Hepatitis B
2 months	<ul style="list-style-type: none"> Hepatitis B, diphtheria, tetanus, acellular pertussis (whooping cough), Haemophilus influenzae type b, inactivated poliomyelitis (polio) (hepB-DTPa-Hib-IPV) Pneumococcal conjugate (13vPCV) Rotavirus
4 months	<ul style="list-style-type: none"> Hepatitis B, diphtheria, tetanus, acellular pertussis (whooping cough), Haemophilus influenzae type b, inactivated poliomyelitis (polio) (hepB-DTPa-Hib-IPV) Pneumococcal conjugate (13vPCV) Rotavirus
6 months	<ul style="list-style-type: none"> Hepatitis B, diphtheria, tetanus, acellular pertussis (whooping cough), Haemophilus influenzae type b, inactivated poliomyelitis (polio) (hepB-DTPa-Hib-IPV) Pneumococcal conjugate (13vPCV) Rotavirus b
12 months	<ul style="list-style-type: none"> Haemophilus influenzae type b and meningococcal C (Hib-MenC) Measles, mumps and rubella (MMR)
18 months	<ul style="list-style-type: none"> Diphtheria, tetanus, acellular pertussis (whooping cough) Measles, mumps, rubella and varicella (chickenpox) (MMRV)
4 years	<ul style="list-style-type: none"> Diphtheria, tetanus, acellular pertussis (whooping cough) and inactivated poliomyelitis (polio) (DTPa-IPV)

Fig. 1. Australian National Immunisation Program Schedule from November 2016.

A step-by-step approach for tailoring infant and child vaccination programmes

Fig. 4. Steps required to implement TIP

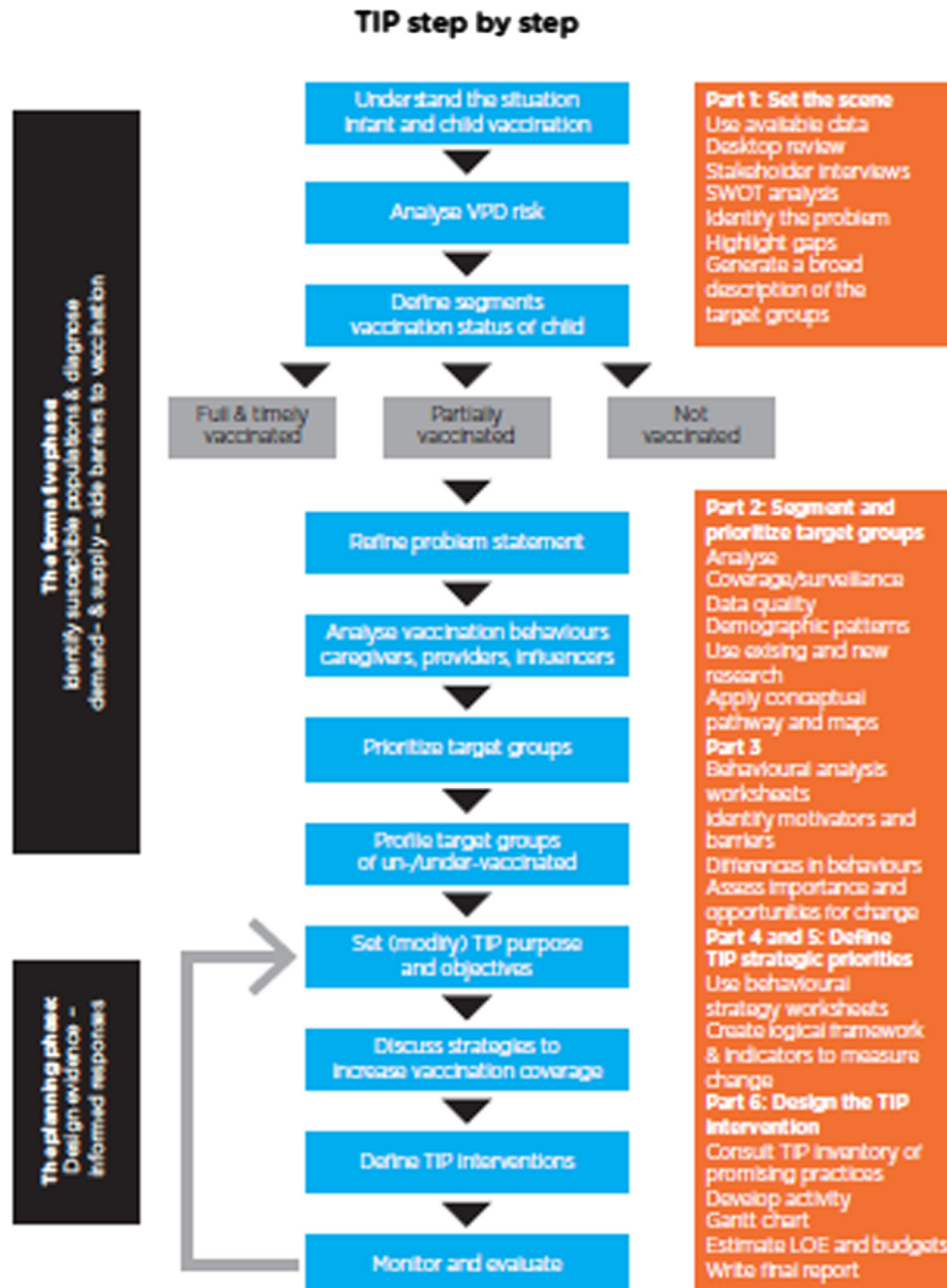


Fig. 2. Implementation pathway for Tailoring Immunization Programmes, World Health Organization, 2013.

vantaged as measured by the Socio-Economic Indexes for Areas (scoring 945, below the national average of 1000) [14].

To confirm trends, analysis was expanded to include 2013–16. Data were cleaned with duplicates removed. Analysis was undertaken using SAS 6.1® and Excel 2010®.

For the qualitative component, researchers first met with stakeholder groups in Maitland to share the quantitative results, discuss

the planned study and develop a trusting relationship. Stakeholders included two community health staff (one manager and one nurse immuniser), the manager of community child health, the manager of the PHN and three team members (representing GPs in Maitland), one representative of the Maitland City Council (which offers immunisation clinics), four public health staff, and the director of the local neighbourhood centre. Purposive sampling

was used to recruit stakeholders uniquely positioned to contribute meaningful insights to the research aim [15].

Semi-structured interviews and focus groups were conducted with health service providers invited by email or telephone. A Participant Information Statement was provided and informed consent was obtained in writing prior to the interview. Parents were invited and interviewed individually either by telephone or in person at the neighbourhood centre where services are provided for those experiencing disadvantage. A comprehensive description of the project with assurances of confidentiality and privacy was provided. Consent was obtained verbally and confirmed by participation.

Service providers were invited to participate in focus groups to generate narrative data and share experiences in a safe environment. Service managers were interviewed individually to capture their views and information regarding immunisation policy and strategic plans. Health service providers were asked about the defining characteristics of children not fully immunised in Maitland, about perceived barriers to achieving full immunisation and what might be done to help parents ensure their children are up-to-date. Parents were asked about their experience with immunisation services, what made it difficult to keep up to date with immunisation and what would make it easier. Interviews were recorded with notes taken by a co-facilitator. Our line of inquiry was dynamic, responding to emerging concepts and themes [16]. Further sampling continued until no new insights emerged.

Recordings were transcribed verbatim and analysed manually by ST (lead on all) and members of the research team. Key concepts were identified and grouped according to the research questions. Ongoing analysis led to the development of themes [15]. These were validated by the research team. Preliminary results were shared with participants to confirm our interpretation and provide opportunity for additional contributions.

The study was guided by an advisory group. Some members provided advice on use of the TIP framework while others were well placed to translate research findings into practice through direct links with public health policy making, health service delivery and community groups. Some members of the advisory group share in authorship of this paper.

Ethics approval was obtained from the Hunter New England Human Research Ethics Committee (HNEHREC 16/07/20/5.08).

3. Results

3.1. Quantitative results

Initial analysis of AIR data for one, two and five year olds not fully immunised, with all scheduled vaccine doses in 2014 accord-

Table 1

Total participants from organisations by number of interviews and focus groups, Maitland, New South Wales, Australia 2017.

Organisation	Individual interviews	Focus group participants	Total
Parents	18	0	18
Community Health ^a	7	12	19
General Practice ^b	6	7	13
Population Health	2	4	6
Maitland City Council	1	2	3
Total	34	25	59

^a Includes Child and Family nurses, Community Health nurses, Community Midwives, Multicultural Liaison and Social Work service providers.

^b Includes Practice Nurses and the Hunter New England Central Coast Primary Health Network; umbrella group representing interests of General Practice.

ing to SA2 location, found the highest number ($n = 384$) resided in Maitland East and Maitland West (supplementary file). Further analysis 2013–2016, including additional SA2 locations of Maitland and Maitland North, confirmed the high numbers missing out were consistent between years (Fig. 3). In 2013, there were 588 children not fully immunised (21.8%), in 2014 there were 492 (17.7%), in 2015 there were 421 (15.2%) and in 2016 there were 427 (15.4%). Each year, the one year old's accounted for most of the children not fully immunised with 344 (37.8%) in 2016. Aboriginal children were not overrepresented in the results (data not shown).

3.2. Qualitative findings

We conducted 34 interviews and 6 focus groups with a total of 59 participants between September 2016 and January 2017 (Table 1). One service provider and one grandparent declined to participate for reasons not stated.

Four themes emerged from our qualitative data; (i) limited engagement with health services unless the need is urgent, (ii) multi-dimensional access barriers to immunisation services in Maitland, (iii) a flexible, supportive family centred, primary health care approach, utilising strong partnerships, is most likely to be effective in increasing childhood immunisation rates in Maitland, (iv) data can be used more effectively to inform service providers about trends and individual children not fully immunised. These are discussed below.

3.2.1. Limited engagement with health services unless the need is urgent

Participants identified children who had fallen behind in immunisation for a variety of reasons, including parents who simply

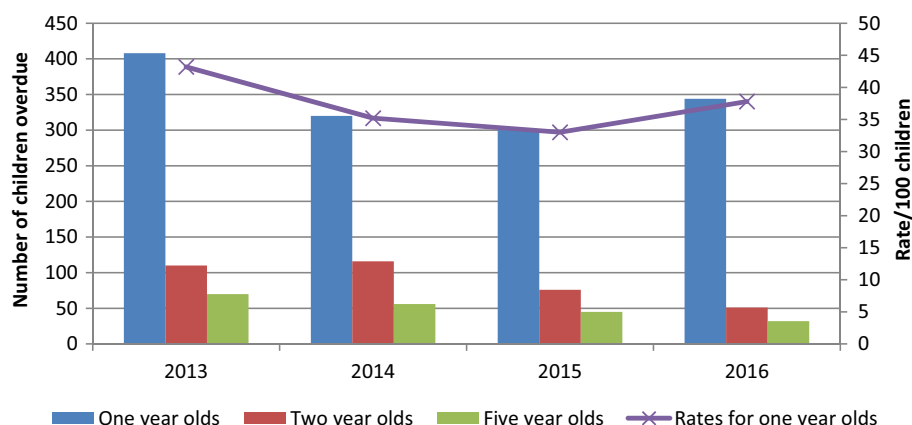


Fig. 3. children aged one, two and five years, not fully immunised in Maitland, NSW 2013–2016.

forgot, had several children all requiring immunisation, were waiting for a Medicare card or had recently moved to Maitland and were busy establishing themselves. One Aboriginal mother with three children had moved to Maitland and did not have a GP or access to transport. After learning about a local Aboriginal health service, the family attended and the children commenced a catch-up program. Another mother recently relocated after a family break-up and had not looked for a GP as she was 'too busy getting my life back in order'.

'Maitland is growing very quickly and for new arrivals, it takes a while to get a GP, getting a job, a house, a school, immunisation falls behind while you're just doing those everyday things. Those people will probably quickly catch up.'

[Service Provider interview]

A second group included parents most likely to be from disadvantaged backgrounds with families that had experienced socioeconomic hardship and problems related to mental health, drug and alcohol dependency, family violence and homelessness. Service providers reported that these parents experienced traumatic backgrounds which led to chaotic lives. Accessing preventative care including immunisation was reported to compete with urgent priorities such as securing food and shelter;

'I think there's a high rate of domestic violence and drugs in our area and those families are so stressed. The basics come first: safety, clothing, feeding. Immunisation would get pushed aside.'

[Nurse focus group 2]

Despite these chaotic lives, some parents struggled to engage with health services to access immunisation. One mother from a CALD background fled with her children from an abusive relationship and became homeless and isolated. She did seek immunisation for her child when she became aware they were overdue but struggled to access a GP. A community nurse eventually provided the immunisation;

'I went into hiding. I was ashamed and homeless. I'm so isolated, I never talk to anyone'.

[Parent interview]

Some service providers acknowledged that young parents living in chaos may distrust health services and fear losing their children to government services, and that this may have contributed to parent's lack of engagement;

'Some families have had involvement in DOCS [Department of Community Services] and they're fearful that 'this will be something else used against me if I go and present myself.'

[Nurse focus group 2.]

'There is someone who is now pregnant and they're couch-surfing [ie homeless]. They're Ice addicts and they're not going to take that baby anywhere to get immunised. So, we either stumble across them or they end up in hospital because they're sick or something else happens.'

[Service Provider interview]

'The majority of clients we see have babies that are already immunised. You're really targeting those who don't access [our] service. I think that's a really hard one.'

[Service Manager interview]

3.2.2. Parents experience multi-dimension access barriers to immunisation services in Maitland

Many participants agreed that access to services was often difficult for those who were falling behind. Some services were not seen to accommodate the needs of parents who struggled with costs, transportation, location, language barriers or hours of operation. Some parents found it difficult to locate a GP that was both available and that would provide a service free of charge (referred to as 'bulk billing');

'The council clinics are not central to them [Aboriginal people]; it's too far. . .they don't have transport to get there.'

[Public Health interview]

'Families are struggling to pay \$30 or more for each visit [to a GP], some of them just can't afford it.'

[Service Provider interview]

'In some families, the wife is from a CALD [culturally and linguistically diverse] background and would like to be informed as well, but they're not at the language level, so that creates a barrier for them and feel they aren't part of it. With this paper [the child's Personal Health Record], they're struggling to understand the meaning of it.'

[Service Provider interview]

There were differing views about the ease of access to GP services. Some participants did not consider cost or availability as barriers. Some put the onus on parents having to request bulk billing;

'They do have choice on where they can go and when they can get in and there's a few that operate extended hours. I don't think there's any access issues, or even if there is, a private billing practice will bulk bill if you actually can't afford that consult.'

[Nurse focus group 4]

'Access and education is good. Most are not working so they can come anytime.'

[General Practice interview]

'We're not outreach. We're relying on people coming to us. We can't really be more proactive.'

[Nurse focus group 3]

3.2.3. A flexible, supportive family centred, primary health care approach, utilising strong partnerships, is most likely to be effective in increasing childhood immunisation rates in Maitland

Interviewers sought participant views about solutions to the relatively high numbers of under vaccinated children. Some felt that existing immunisation services provided by GPs and the Maitland City Council were working well but that to reach those who were falling through the gap, a more targeted approach was needed;

'The only way you'll get that cohort you're focusing on is to have opportunistic immunisation. There's no problem with home visits, having vaccines in the car and saying the child is overdue and asking if they'd like me to do it now. No-one ever says no. It's not a barrier if you can get the vaccine to them.'

[Public Health interview]

Participants suggested increasing the number of community child health workers (already accredited immunisers) who could immunise children within their role either opportunistically or through targeted outreach and home visiting programs;

'Within Hunter New England Health there's about 700 accredited immunisers with less than 100 who immunise children. If we could get all those people immunising children, things would be very accessible. If our early childhood nurses could immunise, that would be just so good.'

[Service Provider interview]

'It would have been hard without home visiting, it helped big time'.

[Parent interview]

Most from community based services felt that a more family centred PHC model that was flexible and responded to parental needs would improve access to immunisation services for the group who were struggling. As one nurse said, 'It needs a carrot not a stick';

'It's difficult for working parents so we offer early and late appointments.'

[General Practice interview]

'Having individuals who are very committed to immunisation makes a huge difference, because they're going to go the extra mile and often it's that extra mile, it's chasing families, it's being really flexible and not too rigid, making sure that the system enables staff to be flexible with families and supports them in doing that so that those families are caught up.'

[Public Health interview]

3.2.4. Data can be used more effectively to inform service providers about trends and individual children not fully immunised

Many health service participants described data quality problems with the AIR and with the timely sharing of relevant information. Some were surprised to learn that there were a high number of children in Maitland who were not fully immunised.

'There are a lot of issues with quality of recording. providers have to chase children who are actually up to date....time is spent in data cleaning and fixing recording errors and on the phone with Medicare'.

[Public Health interview]

'There just needs to be a clearer way, a beautiful report that says this little kid here is due for his four-year old immunisations, or he's due for his two-month, four-month. make it really simple so that GPs who only have a minimal amount of time for each patient can implement a strong recall and reminder system'.

[Service Manager interview]

'There's not a stakeholder meeting in the Maitland area. That's a strategy they use in a lot of other areas but it's not something we've adopted here just because of resources, I think'.

[Public Health focus group]

A grandmother caring for four grandchildren, as her daughter struggled with drug and alcohol and domestic violence issues, expressed frustration as she did not understand the schedule and getting all the records up to date took months;

'The community nurse researched the whole thing. She was an answer to my prayer.'

[Parent interview]

4. Discussion

A number of important barriers faced parents and service providers in this rural region of NSW with a relatively large number of under-vaccinated children. Parents' conflicting priorities, chaotic lives and significant access barriers to primary care emerged as the main reasons that children were not fully immunised. A more tailored approach that was family centred, flexible and supportive, including targeted outreach and home visiting, emerged as the most likely way to improve immunisation coverage for this group. Timely use of quality data, more collaboration amongst stakeholder groups and better use of existing accredited immunisers could improve service delivery.

International studies have shown that parental forgetfulness, younger maternal age [1], multichild families [17] and those who were uninsured [18] were associated with children falling behind.

There is a wealth of evidence that links low vaccine uptake with socio-economic status [1,17,19–21] and with regions of economic hardship [22]. The National Immunisation Survey (2010–2013) in the United States found that 74.6% of children not immunised for measles were due to reasons other than parental objection [22].

In Australia, the proportion of children whose parent(s) object to immunisation has remained consistently low at around 2% [23]. Children are more likely to be under immunised for other reasons including difficulty accessing health services, missed opportunities and logistic barriers. They are also more likely to be from the lowest socio-economic deciles [23]. A longitudinal study found that low social contact and psychological distress experienced by parents also contributed to incomplete childhood immunisation [24]. In our study parents did not mention specific vaccines as the reason for incomplete immunisation.

Many participants in our study, both parents and service providers, spoke of the difficulty in accessing affordable primary care services. Reducing the out-of-pocket costs associated with immunisation has been shown to increase its uptake [25]. Australians contribute substantial 'out-of-pocket' payments for healthcare, which has restricted access to primary care, the main source of immunisation in Australia, particularly for those most disadvantaged [26]. Public Health advocates support addressing funding inequities between public and private providers as a way of encouraging immunisation [27]. Our study showed that one year after the introduction of the No Jab No Pay legislation, the number and rate of one year olds not fully immunised in the Maitland area under study remained virtually unchanged. Despite financial punishment inherent in the new legislation, children whose parents struggle with chaotic lives and conflicting priorities remain under-immunised. Despite this evidence of divergent policy impact in Australia, countries in Europe are also implementing punitive legislation to address low immunisation rates. In Germany, kindergartens must notify authorities of parents who refuse to immunise their children, with significant fines and exclusion of the child until parents comply. France requires compulsory immunisation with 11 vaccinations compared to the previous three. Italy has legislated to ensure children aged 4–16 years have received 12 vaccinations before they can attend school, with large fines for non-compliance [28].

Additional access barriers were uncovered in our study (location, transport, hours of operation). Penchansky's dimensions of access describes the 'degree of fit between the clients and the system' and includes; availability, accessibility, accommodation, affordability and acceptability [29]. Thompson et al. (2016)

describe access barriers specific to vaccine uptake, adding awareness, acceptance (social attitudes) and activation (use of reminders) [21]. Access barriers, combined with social and behavioural factors are determinants of vaccine coverage [1,18,20]. Recognising the complex variety of access barriers faced by some parents can inform a more targeted and supportive approach to immunisation service provision [1]. While provision of immunisation through home visiting may require additional resources in terms of time, ensuring immunisation services are family centred and flexible, combined with supportive government policy, may boost coverage in children [30]. Any interactions with families should include a check of children's immunisation records, address any barriers and immunise opportunistically [22–24]. The results of this study will be used to inform a tailored child immunisation strategy for Maitland that is both acceptable and hopefully sustainable based on the results of the economic analysis that we conducted simultaneously of the strategies implemented.

Our study has important limitations. Firstly, some children appearing on the AIR register as 'not fully immunised' may be up to date but their records have not been entered. This limitation applies to AIR data used throughout the country but data completeness is thought to have improved with the linkage of family benefits to immunisation status. Secondly, as we used 2011 Census data throughout the study period, some of the rates may be lower than our data estimated. We have been guided primarily by numbers of children rather than rates and are confident in the reliability of our results. Thirdly, our parent interviews involved those who eventually accessed immunisation services. The views of parents who do not engage at all with health services have not been captured. Future strategies will need to consider this group of marginalised parents.

5. Conclusion

TIP guidelines proved useful for identifying areas of low coverage and providing an understanding of determining factors and the strategies most likely to be effective. Re-orienting existing health services to include targeted outreach and home visiting, strengthening partnerships between stakeholders, including community representatives, is important so that the timely sharing of quality data can inform service planning. To ensure equitable access and promote the highest possible immunisation coverage for marginalised groups, multiple strategies will be required.

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Conflict of interest

The authors declare no conflict of interest.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.vaccine.2018.03.072>.

References

- [1] Falagas ME, Zarkadoulia E. Factors associated with suboptimal compliance to vaccinations in children in developed countries: a systematic review. *Curr Med Res Opin* 2008;24(6):1719–41.
- [2] World Health Organization. The Guide to Tailoring Immunization Programmes (TIP); Increasing Coverage of Infant and Child Vaccination in the WHO European Region Copenhagen, Denmark 2013 [20 February]. Available from: <http://www.euro.who.int/en/health-topics/communicable-diseases/poliomyelitis/publications/2013/guide-to-tailoring-immunization-programmes>.
- [3] World Health Organization. Evaluation of the WHO Regional Office for Europe, Tailoring Immunization Programmes (TIP) behavioural insights tool and approach, final report. WHO Regional Office for Europe, Denmark; 2016.
- [4] Australian Government Department of Health. Immunise Australia Program, National Immunisation Program Schedule [4 March 2017]. Available from: <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/nips>.
- [5] Australian Technical Advisory Group on Immunisation. Bulletin 53rd Meeting 20–21 February, Canberra 2014 [Available from: <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/atagi-meet53bulletin>].
- [6] Australian Government Department of Health. National Immunisation Strategy for Australia 2012–2018: Department of Health 2013; [cited 2016 15 Dec]. Available from: <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/immunisation-strategy-2013-18-cnt>.
- [7] Australian Government. Medicare: Department of Human Services; 2018 [cited 2018 13 February]. Available from: <https://www.humanservices.gov.au/individuals/medicare>.
- [8] Kiil A, Houlberg K. How does copayment for health care services affect demand, health and redistribution? A systematic review of the empirical evidence from 1990 to 2011. *Eur J Health Econ* 2014;15(8):813–28.
- [9] Australian Government Department of Health. Immunise Australia Program, No Jab, No Pay-New Immunisation Requirements for Family Assistance Payments, Fact Sheet for vaccination providers 2017 [11 Oct 2017]. Available from: <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/fact-sheet-no-jab-no-pay>.
- [10] Australian Government Department of Human Services. Immunisation Requirements 2017 [Available from: <https://www.humanservices.gov.au/customer/enablers/immunisation-requirements>].
- [11] Australian Bureau of Statistics Census Community Profiles, Maitland (LGA); 2011 [cited 2017 10 January 2017]. Available from: http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/communityprofile/LGA15050.
- [12] Australian Bureau of Statistics. Australian Statistical Geography Standard (ASGS): Volume 1 – Main Structure and Greater Capital City Statistical Areas, July 2011. 2016 [cited 2017 10 May]. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/88F6A0E8B879C0CA257801000C64D9>.
- [13] Australian Bureau of Statistics. Regional summary, Maitland LGA, New South Wales 2017 [cited 2018 14 February]. Available from: http://stat.abs.gov.au/itt/r.jsp?RegionSummary®ion=15050&dataset=ABS_REGIONAL_LGA2016&geoconcept=LGA_2016&maplayerid=LGA2016&measure=MEASURE&datasetASGS=ABS_REGIONAL_ASGS2016&datasetLGA=ABS_REGIONAL_LGA2016®ionLGA=LGA_2016®ionASGS=ASGS_2016.
- [14] Australian Bureau of Statistics. SEIFA by Statistical Area 2 (SA2) 2018 [cited 2018 14 February]. Available from: http://stat.data.abs.gov.au/Index.aspx?DataSetCode=ABS_SEIFA_LGA.
- [15] Carter SM, Ritchie JE, Sainsbury P. Doing good qualitative research in public health: not as easy as it looks. *New South Wales Public Health Bull* 2009;20(8):105–11.
- [16] Taylor SJ, Bogdan R, DeVault M. Introduction to qualitative research methods: a guidebook and resource. John Wiley & Sons; 2015.
- [17] de Cantuária Tauil M, Sato APS, Waldman EA. Factors associated with incomplete or delayed vaccination across countries: a systematic review. *Vaccine* 2016;34(24):2635–43.
- [18] Butler R, MacDonald NE. Diagnosing the determinants of vaccine hesitancy in specific subgroups: the Guide to Tailoring Immunization Programmes (TIP). *Vaccine* 2015;33(34):4176–9.
- [19] Ward K, Chow MYK, King C, Leask J. Strategies to improve vaccination uptake in Australia, a systematic review of types and effectiveness. *Austral NZ J Public Health* 2012;36(4):369–77.
- [20] Larson HJ, Jarrett C, Eckersberger E, Smith DM, Paterson P. Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: a systematic review of published literature, 2007–2012. *Vaccine* 2014;32(19):2150–9.
- [21] Thomson A, Robinson K, Vallée-Tourangeau G. The 5As: a practical taxonomy for the determinants of vaccine uptake. *Vaccine* 2016;34(8):1018–24.
- [22] Smith PJ, Marcuse EK, Seward JF, Zhao Z, Orenstein WA. Children and adolescents unvaccinated against measles: geographic clustering, parents' beliefs, and missed opportunities. *Public Health Rep* 2015;130(5):485–504.
- [23] Beard FH, Hull BP, Leask J, Dey A, McIntyre PB. Trends and patterns in vaccination objection, Australia, 2002–2013. *Med J Australia* 2016;204(7):275.
- [24] Pearce A, Marshall H, Bedford H, Lynch J. Barriers to childhood immunisation: Findings from the Longitudinal Study of Australian Children. *Vaccine* 2015;33(29):3377–83.

- [25] Fiske ST, Betsch C, Böhm R, Chapman GB. Using behavioral insights to increase vaccination policy effectiveness. *Policy Insights from the Behav Brain Sci* 2015;2(1):61–73.
- [26] Duckett S. Many Australians pay too much for health care-here's what the government needs to do: The Conversation; 2016 [Available from: <<https://grattan.edu.au/news/many-australians-pay-too-much-for-health-care-heres-what-the-government-needs-to-do/>>].
- [27] Public Health Association Australia. Public Health Association of Australia: Policy-at-a-glance-Immunisation Policy 2015 [cited 2017 21 April]. Available from: <<https://www.phaa.net.au/advocacy-policy/policies-position-statements/policies-position-statements#Immunisation>>.
- [28] Yang YT, Reiss DR. French mandatory vaccine policy. *Vaccine* 2018.
- [29] Penchansky R, Thomas JW. The concept of access: definition and relationship to consumer satisfaction. *Med Care* 1981;19(2):127–40.
- [30] Bond L, Nolan T, Lester R. Immunisation uptake, services required and government incentives for users of formal day care. *Austral NZ J Public Health* 1999;23(4):368–76.